IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND INTERFERENCES

In re PATENT APPLICATION of:

SEGERS *et al.*

Group Art Unit: 2851

Appln. No.: 09/552,672

Examiner: Fuller, Rodney Evan

Filed: April 19, 2000

Title: LITHOGRAPHIC PROJECTION APPARATUS

BRIEF ON APPEAL

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I. INTRODUCTION

This Appeal is from an Office Action mailed March 21, 2003, finally rejecting claims 1-30.

A. Real Party in Interest

The real party in interest for this Appeal and the present application is ASML NETHERLANDS B.V., by way of an Assignment to LITHOGRAPHY B.V. recorded in the U.S. Patent and Trademark Office at Reel/Frame 010736/0878 on April 19, 2000 and a name change to ASML Netherlands B.V. recorded in the U.S. Patent and Trademark Office at Reel/Frame 012735/0001 on March 28, 2002.

B. Statement of Related Appeals and Interferences

There are presently no appeals or interferences known to Appellant, Appellant's representatives or the Assignee, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

C. Status of Claims

Claims 1-19 and 21-30 are pending. Claims 1-19 and 21-30 stand rejected and are on appeal. Claims 1, 10, 12 and 15 are independent. Claims 2-9 and 14 are dependent directly or indirectly from claim 1; claims 11 and 25-30 are dependent from claim 10; claims 13 and 21-24 are dependent from claim 12; and claims 16-19 are dependent from claim 15.

D. Status of Amendments

A Preliminary Amendment was filed April 19, 2000. An Amendment under 37 C.F.R. § 1.111 was filed July 17, 2002 in reply to an April 17, 2002 Office Action. An Amendment under 37 C.F.R. §1.111 was filed January 15, 2003 in response to an October 22, 2002 Office Action. An Amendment After Final under 37 C.F.R. §1.116 was filed June 23, 2003 in response to a Final Rejection dated March 21, 2003. The Amendment After Final Rejection canceled claim 20, amended claim 21 to depend from claim 12 and amended claim

12 to include the limitation recited in claim 20. An Advisory Action dated July 8, 2003 granted entry of the Amendment for purpose of Appeal. All claim amendments of record have been entered.

II. SUMMARY OF THE INVENTION

A. Related Art Problems Overcome by the Invention

In conventional lithographic apparatuses, a substrate is held on a substrate table firmly in a fixed position during an exposure process. The substrate is conventionally held in the fixed position by applying a vacuum to a major surface of the substrate table. The vacuum sucks the substrate firmly to substrate table. Prior to positioning the substrate on the substrate table, the substrate will often be processed (for example, spin-coated with a resist) in a process track. Therefore, the temperature of the substrate can be different from the temperature of the substrate table. This can lead to problems. For example, the temperature of the substrate table can change after the substrate is positioned on the substrate table and the substrate table can cool the substrate. The cooling of the substrate causes the substrate to shrink.

However, because the substrate is being held firmly by the substrate holder, the substrate does not have the same freedom to shrink as would be the case if it were not held. The substrate can only shrink when the tension inside the substrate is higher than the friction between the substrate and the surface of the substrate table. If this occurs, a portion of the substrate will slip over the surface of the substrate table to release the tension inside the substrate. This slip movement can lead to errors in super-positioning two images exposed on successive layers on the substrate which can lead to so-called overlay error. In general, the super-positioning of two images is accurately achieved by aligning a mark on the substrate to a reference mark (for example, a reference mark on the mask, or a fiducial mark on the

substrate table). In the event the substrate slips after aligning the substrate to the reference mark, the super-positioning of two images on the slip part of the substrate can fail. Similarly, if the substrate is colder than the substrate table and is warmed by the substrate table, the substrate would tend to expand and thus can also slip over the surface of the substrate table.

B. Aspects of the Invention

An aspect of the invention is to provide a lithographic apparatus comprising, *inter-alia*, a substrate table provided with a substrate holder constructed and arranged to hold a substrate and a preparatory station comprising an intermediate table on which a substrate can be positioned before transfer to the substrate table. The intermediate table comprises a major surface provided with a plurality of apertures and a gas bearing generator constructed and arranged to generate a gas bearing between the major surface and a substrate located on the major surface. The gas bearing substantially removes the friction between the substrate and the major surface of the intermediate table. In this way, the substrate can, for example, easily expand and shrink on the gas bearing when the temperature of the substrate changes. In addition, the gas bearings can eliminate contamination of the backside of the substrate by foreign particles. In some instances, particles already collected on the backside of the substrate may even be blown away from the backside by the gas bearing.

C. Embodiment 1 of the Invention

Figure 1 schematically depicts a lithographic projection apparatus including a radiation system LA, Ex, IN, CO for supplying a projection beam of radiation PB, a mask table MT provided with a mask holder to hold mask MA, a substrate table WT provided with a substrate holder to hold substrate W, and a projection system PL. The beam PB intercepts the mask MA. The beam PB then passes through the projection system PL which focuses the beam PB onto a target C of the substrate W. (Page 7, line 31 through page 9, line 10.)

D. Embodiment 2 of the Invention

Referring to Figure 2a, a preparatory station includes an intermediate table 5 comprising a gas chamber 7 connected via apertures 9 to a major surface 11. A substrate (wafer) 1 having an edge 3, a front side 1a and a backside 1b can be deposited on the intermediate table 5. The preparatory station further includes a rotation unit 15 comprising an actuator 17 and a vacuum holder 19 for holding and rotating the substrate 1 above the intermediate table 5. The preparatory station also comprises a gas bearing comprising a gas source 21 for supplying a gas to the major surface 11 via the apertures 9, the gas chamber 7 and a tube 23. A detector 25 includes an edge detector 27 for detecting the edge 3 of substrate 1 and a mark detector 29 for detecting a mark on the front side 1a of substrate 1. (Page 9, lines 15-27.)

A substrate transporter holds the substrate 1 above the major surface 11 and the vacuum holder 19 will be moved by the actuator 17 towards the major surface 11 up to the backside 1b of the substrate 1. A vacuum is applied to the vacuum holder 19 such that the backside 1b is sucked to the vacuum holder 19. The substrate transporter is then released from the backside 1b of substrate 1 and moved away from the major surface 11. The actuator 17 retracts the vacuum holder 19 toward the major surface 11 and a gas is supplied to the surface 11 by the gas source 21 via tube 23, the gas chamber 7 and the apertures 9. The gas, thus, creates a gas bearing between the substrate 1 and the major surface 11. (Page 9, line 28 through page 10, line 7.)

As shown in Figure 2b, the gas source 21 can comprise a pump 31, a gas ionizer 33, a second controller 35 for temperature control of the gas, a gas filter 37 and an air inlet 39. The gas ionizer 33 ionizes the gas used to create the gas bearing. The ions in the gas will be

attracted by any static charge collected on the backside 1b of the substrate 1 and will neutralize such charge. (Page 10, lines 8-18.)

The intermediate table 5 can comprise a first controller constructed and arranged to control the temperature of intermediate table 5. By controlling the temperature of the intermediate table 5, the temperature of the substrate 1 can be influenced. One mechanism of influencing the temperature of the substrate 1 can be by thermal radiation between the substrate 1 and the surface 11. Another mechanism of influencing the temperature of the substrate 1 can be that the temperature of the intermediate table 5 influences the temperature of the gas used in the gas bearing, and the temperature of the gas influences the temperature of the substrate 1. In particular, when the gap caused by the gas bearing between the substrate 1 and the surface 11 is thin, for example, less than 150 μm, the temperature of the intermediate table 5 can have a strong and rapid influence on the temperature of the substrate. (Page 10, lines 19-27.)

The first and/or the second controller can maintain the intermediate table 5 and the gas at a temperature substantially equal to the temperature of the substrate table WT. For example, one could employ a sensor to measure the temperature of the substrate table WT and one could regulate the temperature in the first and/or second controller such that the temperature is substantially equal to the measured temperature. This allows the temperature of the substrate to be equal to the temperature of the substrate table before transfer. Thus, substantially no shrinkage or expansion of the substrate would occur after placement of the substrate on the substrate table WT. (Page 10, line 28 through page 11, line 3).

In measuring the orientation of the substrate 1 on the intermediate table 5, the mark detector 29 can be used to detect a mark on the from side of the substrate 1a, and/or the edge detector 27 can be used to detect the edge 3 of the substrate 1. The edge detector 27

measures the eccentricity of the substrate 1 on the intermediate table 5. This is accomplished by actuator 17 which rotates the vacuum holder 19 around an axis perpendicular to the plane of the intermediate table such that edge 3 of the substrate 1 rotates underneath the edge detector 27 (Figure 2c, which shows a plan view of the intermediate table 5 without a substrate positioned thereon). The edge detector can emply a capacitive sensor or an optical sensor. In this way a notch or flat edge can be automatically oriented as desired, before substrate 1 is transferred to the substrate table WT, and the eccentricity of the substrate can be measured and determined if the substrate falls outside the capture range of the alignment module employed at the substrate table WT. If the first position of the substrate 1 on the intermediate table is not within the capture range of the alignment module, one would like to reposition the substrate on the intermediate table, otherwise the substrate cannot be accurately transferred to the required position on the substrate table WT for exposure. For this positioning, the intermediate table 5 is provided with a movable portion 41 comprising second vacuum holder 43 which can be sucked against backside 1b of substrate 1, and a displacer 45 for moving the second holder 43. If the substrate 1 is not in the desired in-plane position on the intermediate table 5 , the substrate 1 on the intermediate table will be rotated such that the center of the substrate 1 and the center of the holder 19 will be in one straight line with the movable portion 41. Subsequently, the second holder 43 will be sucked to the backside 1b of the substrate 1 and the vacuum in the holder 19 will be released. The second holder 43 will be moved by the displacer 45, to or away from the center of the holder 19, such that after release of the vacuum in the second holder 43, the substrate 1 will have the required in-plane position. In the required position the center of the substrate 1 will be substantially at the same position as the center of the holder 19. If necessary more than one movable portion 41 can be used. (Page 11, line 4 through page 12, line 3.)

E. Embodiment 3 of the Invention

Referring to Figure 3, the gas source 21 delivers gas through tube 23, the gas chamber 7 and the apertures 9 to the gas bearing. The gas in the gas bearing is evacuated through evacuation apertures 49 and the evacuation tube 51 to an evacuation pump 47. Any foreign particles present on the backside 1b of the substrate 1 can be evacuated to the evacuation pump 47. If the evacuation pump were not present, foreign particles could be blown off the backside of the substrate 1 into the apparatus where the foreign particles could cause contamination problems. Another advantage of evacuating the gas is the ability to control the thickness of the gas bearing if the inflow and the evacuation of gas are controlled. The evacuated gas can be returned to gas source 21, such that after filtering the gas it can be reused in the gas bearing. (Page 12, lines 4-14.)

F. Embodiment 4 of the Invention

Referring to Figure 4, the gas bearing is relatively thick (i.e. larger than 150 μm). Gas is supplied to the gas bearing from the gas source 21 through tube 23, the gas chamber 7 and the apertures 9. If such a gas bearing is used, the gas source 21 will advantageously be equipped with a second controller for directly controlling the temperature of the gas.

III. ISSUES AND REJECTIONS

The March 21, 2003 Office Action rejects claims 1, 4, 7, 8-15, 17-19, 23, 24, 29 and 30 under 35 U.S.C. §103(a) over Takizawa (U.S. Patent 5,471,279) in view of Ota (U.S. Patent 6,228,544); rejects claims 12 and 13 under 35 U.S.C. §103(a) over Leoff (U.S. Patent No. 3,603,646) in view of Doley et al. (U.S. Patent No. 6,161,311); rejects claims 2, 16 and 25 under 35 U.S.C. §103(a) over Takizawa in view of Ota and Doley et al.; rejects claims 3, 5, 6, 15, 20-22 and 26-28 under 35 U.S.C. §103(a) over Takizawa in view of Ota and Tsutsui (U.S. Patent No. 4,720,732).

Appellant notes that claim 15 was rejected under both Takizawa in view of Ota and Takizawa in view of Ota and Tsutsui. Claim 15 is patentable over both combinations and will be separately argued below.

Thus, the issues on appeal are whether: (1) claims 1, 4, 7, 8-15, 17-19, 23, 24, 29 and 30 are patentable over Takizawa in view of Ota, (2) claims 12 and 13 are patentable over Leoff in view of Doley et al., (3) claims 2, 16 and 25 are patentable over Takizawa in view of Ota and Doley et al., and (4) claims 3, 5, 6, 15, 20-22 and 26-28 are patentable over Takizawa in view of Ota and Tsutsui.

IV. GROUPING OF CLAIMS

Each claim of this patent application is separately patentable and upon issuance of a patent will be entitled to a separate presumption of validity under 35 U.S.C. §282. For convenience in handling of this Appeal, the claims are grouped as follows:

Group I, claims 1-9 and 14;

Group II, claims 10-11 and 25-30;

Group III, claims 12-13 and 21-24; and

Group IV, claims 15-19.

Each of Groups I through IV will be argued separately in the following arguments. The groups do not stand or fall together. In addition, the claims within each Group do not stand or fall together and are argued separately in the following arguments.

V. ARGUMENT

A. The Law Regarding Factual Inquiries to Determine Obviousness/Non-Obviousness

Several basis factual inquiries must be made to determine obviousness or non-obviousness of patent application claims under 35 U.S.C. § 103. These factual inquiries are set forth in Graham v. John Deere Co., 383 US 1, 17, 148 USPQ 459, 467 (1966);

> Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or non-obviousness of the subject matter is determined.

As stated by the Federal Court in In re Ochiai, 37 USPQ 2d 1127, 1131 (Fed. Cir. 1995);

> [T]he test of obviousness *vel non* is statutory. It requires that one compare the claim's subject matter as a whole with the prior art to which the subject matter pertains. 35 U.S.C. § 103. The inquiry is thus highly fact-specific by design . . . When the references cited by the Examiner fail to establish a *prima facie* case of obviousness, the rejection is improper and will be overturned. In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988) (Emphasis added).

In rejecting claims under 35 U.S.C. § 103(a), an Examiner bears an initial burden of presenting a *prima facie* case of obviousness. A *prima facie* case of obviousness is established only if there is a suggestion or motivation to combine reference teachings; a reasonable expectation of success; and the prior art references, when combined, teach or suggest all the claim limitations. If an Examiner fails to establish a *prima facie* case, a rejection is improper and will be overturned. See In re Rijckaert, 9 F.3d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993). "If examination . . . does not produce a *prima facie* case of unpatentability, then without more, the Applicant is entitled to the grant of the patent." In re Oetiker, 977 F.2d 1443, 1445-1446, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).

B. Rejections Under 35 U.S.C. § 103(a)

1. Takizawa

Takizawa discloses a substrate supporting apparatus having a float chuck 1 and a base chuck 2. Pressurized air is supplied between the float chuck and the base chuck to float the float chuck. The substrate is attracted to a surface of the float chuck with a vacuum attraction force. The float chuck 1 is attracted to or floated on the surface of the base chuck 2 by a vacuum attraction force or pressurized air supplied from the evacuation/supply line (see col. 4, lines 56-58 in Takizawa). As clearly stated in col. 6, lines 8-15 of Takizawa, the substrate is attracted to the float chuck 1 and the floating force of the pressurized air does not act on the substrate directly.

2. Ota

Ota discloses a temperature adjustment plate 20 for cooling a substrate 9 before transporting the substrate 9 onto a substrate stage 8. The temperature adjustment plate has a substrate lifting device 21 which has spindles 21a-21c having holes at the tip to support the substrate 9 through vacuum absorption (suction). The spindles 21a-21c are vertically moved by driving device 23 (see col. 6, lines 55-64) to lift the substrate 9.

3. Leoff

Leoff discloses a gravity-type air slide allowing self-controlled spacing of a plurality of articles which are gravity fed along the transport path in sequence. The gravity-type air slide employs at least one vacuum braking or hold member which lies in juxtaposition to the path of movement of the articles. When the moving article overlies the hold member there is an increase in vacuum within the hold member. The air slide 10 comprises manifold 12 in the form of an imperforate casing 14 supporting a porous planar member 16. Air enters the manifold 12 through a conduit 18 creating a film of air on the outer surface 20 of the porous member 16 which supports an article such as wafer 22 (see col. 2, lines 36-50). A vacuum

tube constituting a vacuum hold is embedded into the porous member 16 of the air slide such that an open end 28 of the vacuum tube lies just beneath the surface 20.

4. Doley

Doley discloses an apparatus for reducing particles in epitaxial reactors used for epitaxial deposition of materials onto a silicon wafer. The apparatus includes lines for delivering a purge gas into a chamber handling the wafer. The purge gas is ionized with ionizers. The conductive ionized gas facilitates the discharge of particles from the wafer or surfaces of the reactor chamber. By removal of the static charge, particles and wafers are no longer attracted to each other by electrostatic force.

5. Tsutsui

Tsutsui discloses a transfer apparatus for transferring a pattern of a mask onto a wafer. The apparatus includes a wafer chuck for holding the wafer. The temperature of the wafer held by the wafer chuck is controlled to expand/contract the wafer to achieve alignment of the pattern of the mask with a pattern formed on the wafer. Within the wafer chuck is provided a cavity through which a thermo-regulated fluid such as heated air flows.

6. Claims 1, 4, 7, 8-15, 17-19, 23, 24, 29 and 30 Are Patentable Over Takizawa in view of Ota

The March 21, 2003 Office Action, on page 4, paragraph number 2, states "Takizawa discloses all the structure set forth in the claims except for the limitation as argued by the Applicant of '...an intermediate table on which a substrate can be positioned before transfer to the substrate table.' However, the use of an intermediate table on which a substrate can be positioned before transfer to the substrate table is routine in the art as evident from the teaching of Ota (US 6,228,544) (Fig. 1, ref.# 20). Thus, it would have been obvious to one of

ordinary skill in the art at the time the invention was made to modify Takizawa (US 5,471,279) by including an intermediate table on which a substrate can be positioned before transfer to the substrate table. The ordinary artisan would have been motivated to modify Takizawa (US 5,471,279) in the manner described above for at least the purpose of removing a quantity of heat corresponding to a heat accumulation on the substrate stage during exposure as described by Ota (US 6,228,544) (abstract)."

> Claim 1 recites: A lithographic projection apparatus, comprising: a radiation system constructed and arranged to supply a projection beam of radiation; a mask table provided with a mask holder constructed and arranged to hold a substrate; a substrate table provided with a substrate holder constructed and arranged to hold a substrate; a projection system constructed and arranged to image an irradiated portion of the mask onto a target portion of the substrate; a preparatory station comprising an intermediate table on which a substrate can be positioned before transfer to the substrate table, the intermediate table comprising a major surface provided with a plurality of apertures; and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon.

It is respectfully submitted that Takizawa merely discloses a substrate supporting apparatus having a float chuck and a base chuck. Pressurized air is supplied between the float chuck and the base chuck and not between the substrate and the float chuck. The pressurized air serves to float the float chuck. The substrate is attracted to a surface of the float chuck by a vacuum attraction force (suction). As clearly stated in col. 6, lines 8-15 of Takizawa, the substrate is attracted to the float chuck and the floating force of the pressurized air does not act on the substrate. Therefore, Takizawa fails to disclose, teach or suggest an intermediate table comprising a major surface provided with a plurality of apertures, and Takizawa also fails to disclose, teach or suggest a gas bearing generator constructed and arranged to generate a gas bearing between the major surface and a substrate located thereon.

In addition, it is respectfully submitted that Ota merely discloses a temperature adjustment plate 20 for cooling a substrate 9 before transporting the substrate 9 onto a

substrate stage 8. The temperature adjustment plate has spindles 21a-21c having holes at the tip to support the substrate 9 through vacuum absorption (suction). Thus Ota does not disclose, teach or suggest a gas bearing generator constructed and arranged to generate a gas bearing between the major surface and a substrate located thereon.

As neither Takizawa nor Ota discloses or suggests a gas bearing generator constructed and arranged to generate a gas bearing between the major surface of an intermediate table and a substrate located thereon, the combination fails to include all the limitations of claim 1 and fails to present a *prima facie* case of obviousness against claim 1. See MPEP § 2141. Accordingly, even assuming *arguendo* it would have been obvious to modify Takizawa by including a temperature adjustment plate as taught by Ota, one would still not obtain "the intermediate table comprising a major surface provided with a plurality of apertures; and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon," as recited in claim 1. Moreover, there is no motivation or suggestion to modify Takizawa by including "the intermediate table" of Ota.

> Claim 10 recites: A device manufacturing method comprising: (a) providing a mask table with a mask which contains a pattern, (b) providing a substrate table with a substrate which is at least partially covered by a layer of radiation-sensitive material, (c) prior to (b), providing the substrate to an intermediate table comprising a major surface provided with a plurality of apertures, and maintaining the substrate for a given time interval upon a gas bearing generated between the major surface and the substrate; and (d) using a projection beam of radiation to project an irradiated part of the mask onto a target area of the layer of radiation-sensitive material.

For at least the reasons discussed above with respect to claim 1, neither Takizawa nor Ota, alone or in combination, disclose, teach or suggest "providing the substrate to an intermediate table comprising a major surface provided with a plurality of apertures, and maintaining the substrate for a given time interval upon a gas bearing generated between the major surface and the substrate," as recited in claim 10.

Claim 10 is also separately patentable as neither Takizawa nor Ota disclose or suggest maintaining the substrate for a given time interval upon a gas bearing generated between the major surface and the substrate. Furthermore, there is no motivation or suggestion for combining the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 12 recites: A substrate preparing device comprising an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus; the intermediate table comprising a major surface provided with a plurality of apertures, and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon; a first temperature controller constructed and arranged to regulate a temperature of the intermediate table; and an ionizer constructed and arranged to ionize the gas.

For at least the reasons discussed above with respect to claim 1, neither Takizawa nor Ota, alone or in combination, disclose, teach or suggest "an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus; the intermediate table comprising a major surface provided with a plurality of apertures, and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon," as recited in claim 12.

Furthermore, claim 12 is separately patentable as neither Takizawa nor Ota disclose or suggest an ionizer constructed and arranged to ionize the gas of the gas bearing. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 15 recites: A substrate preparing device comprising: an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus, the intermediate table comprising a major surface provided with a plurality of apertures; a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon; and a temperature controller constructed and arranged to regulate a temperature of at least one of the intermediate table and the temperature of the gas.

For at least the reasons discussed above with respect to claim 1, neither Takizawa nor Ota, alone or in combination, disclose, teach or suggest "an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus, the intermediate table comprising a major surface provided with a plurality of apertures; a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon," as recited in claim 15.

Furthermore, claim 15 is separately patentable as there is no motivation or suggestion in either Takizawa or Ota, to modify Takizawa to include the temperature-adjustment plate of Ota. Therefore, neither Takizawa nor Ota disclose or suggest, alone or in combination, the subject matter recited in claim 15. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

Therefore, Appelant respectfully submits that the March 21, 2003 Office Action fails to establish a *prima facie* case of obviousness against independent claims 1, 10, 12 and 15.

> Claim 4 recites: An apparatus according to claim 1, wherein said gas bearing has a thickness less than 150 μm.

Claim 4 is dependent from claim 1. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 1, it is respectfully submitted that claim 4 is also patentable for at least the reasons provided in claim 1. Furthermore, claim 4 is separately patentable as neither Takizawa nor Ota disclose or suggest a gas bearing having a thickness less than 150 μm. Indeed, although pressurized air is supplied between the float chuck and the base chuck to float the float chuck in Takizawa, Takizawa, however, does not disclose anywhere the thickness of the pressurized air and as

stated previously Takizawa merely supplies pressurized air between the float chuck and the base chuck, not between the substrate and the float chuck.

> Claim 7 recites: An apparatus according to claim 1, wherein said apparatus further comprises: a position detector constructed and arranged to detect a first position of said substrate on said intermediate table; a displacement calculator for calculating a required displacement between said first position and a desired position of the substrate on the intermediate table; and an actuator constructed and arranged to move said substrate from said first position to said desired position.

Claim 7 is dependent from claim 1. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 1, it is respectfully submitted that claim 7 is also patentable for at least the reasons provided above with respect to claim 1. Furthermore, claim 7 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, a position detector constructed and arranged to detect a first position of the substrate on the intermediate table; a displacement calculator for calculating a required displacement between the first position and a desired position of the substrate on the intermediate table; and an actuator constructed and arranged to move the substrate from the first position to said desired position. Moreover, the is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 8 recites: An apparatus according to claim 7, wherein said position detector is constructed and arranged to detect an edge of the substrate.

Claim 8 is indirectly dependent from claim 1. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 1, it is respectfully submitted that claim 8 is also patentable for at least the reasons provided above with respect to claim 1. In addition, as claim 8 is dependent from claim 7, claim 8 is also patentable for at least the reason provided above in claim 7. Furthermore, claim 8 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in

combination, the position detector constructed and arranged to detect an edge of the substrate. Moreover, there is no motivation or suggestion to combine to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 9 recites: An apparatus according to claim 7, wherein said position detector is constructed and arranged to detect a mark on a substrate.

Claim 9 is indirectly dependent from claim 1. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 1, it is respectfully submitted that claim 9 is also patentable for at least the reasons provided above with respect to claim 1. In addition, as claim 9 is dependent from claim 7, claim 8 is also patentable for at least the reason provided above with respect to claim 7. Furthermore, claim 9 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, the position detector constructed and arranged to detect a mark on a substrate.

> Claim 11 recites: A device manufactured in accordance with a method as claimed in claim 10.

Claim 11 is dependent from claim 10. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 10, it is respectfully submitted that claim 11 is also patentable for at least the reasons provided above with respect to claim 10. Furthermore, claim 11 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, a device manufactured in accordance with the method recited in claim 10. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 13 recites: A substrate preparing device according to claim 12, wherein said gas bearing generator comprises: a gas source arranged to deliver gas through the apertures to generate a gas bearing, and an evacuation pump arranged to evacuate the gas from the gas bearing.

Claim 13 is dependent from claim 12. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 12, it is respectfully

submitted that claim 13 is also patentable for at least the reasons provided above with respect to claim 12. Furthermore, claim 13 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, the gas bearing generator comprises a gas source arranged to deliver gas through the apertures to generate a gas bearing and an evacuation pump arranged to evacuate the gas from the gas bearing. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 14 recites: An apparatus according to claim 7, wherein said gas bearing generator comprises: a gas source arranged to deliver gas through the apertures to generate the gas bearing, and an evacuation pump arranged to evacuate the gas from the gas bearing.

Claim 14 is indirectly dependent from claim 1. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 1, it is respectfully submitted that claim 14 is also patentable for at least the reasons provided above with respect to claim 1. In addition, as claim 14 is dependent from claim 7, claim 14 is also patentable for at least the reason provided above in claim 7. Furthermore, claim 14 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, the gas bearing generator comprises a gas source arranged to deliver gas through the apertures to generate the gas bearing, and an evacuation pump arranged to evacuate the gas from the gas bearing. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 17 recites: A substrate preparing device according to claim 15, further comprising: a position detector constructed and arranged to detect a first position of said substrate on said intermediate table; a displacement calculator constructed and arranged to calculate a required displacement between said first position and a desired position of the substrate on the intermediate table; and an actuator constructed and arranged to move said substrate from said first position to said desired position.

Claim 17 is dependent from claim 15. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 15, it is respectfully submitted that claim 17 is also patentable for at least the reasons provided above with respect to claim 15. Furthermore, claim 17 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, a position detector constructed and arranged to detect a first position of the substrate on the intermediate table; much less a displacement calculator constructed and arranged to calculate a required displacement between the first position and a desired position of the substrate on the intermediate table. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 18 recites: A substrate preparing device according to claim 15, wherein said gas bearing generator comprises: a gas source arranged to deliver gas through said plurality of apertures to generate the gas bearing; and an evacuation pump arranged to evacuate the gas from the gas bearing.

Claim 18 is dependent from claim 15. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 15, it is respectfully submitted that claim 18 is also patentable for at least the reasons provided above with respect to claim 15. Furthermore, claim 18 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, the gas bearing generator comprises: a gas source arranged to deliver gas through the plurality of apertures to generate the gas bearing; and an evacuation pump arranged to evacuate the gas from the gas bearing. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 19 recites: A substrate preparing device according to claim 15, wherein said substrate preparing device is a part of a resist processing apparatus.

Claim 19 is dependent from claim 15. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 15, it is respectfully submitted that claim 19 is also patentable for at least the reasons provided above with respect to claim 15. Furthermore, claim 19 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, the substrate preparing device is a part of a resist processing apparatus. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 23 recites: A substrate preparing device according to claim 12, further comprising: a position detector constructed and arranged to detect a first position of said substrate on said intermediate table; a displacement calculator constructed and arranged to calculate a required displacement between said first position and a desired position of the substrate on the intermediate table; and an actuator constructed and arranged to move said substrate from said first position to said desired position.

Claim 23 is dependent from claim 12. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 12, it is respectfully submitted that claim 23 is also patentable for at least the reasons provided above with respect to claim 12. Furthermore, claim 23 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, a position detector constructed and arranged to detect a first position of said substrate on said intermediate table much less a displacement calculator constructed and arranged to calculate a required displacement between said first position and a desired position of the substrate on the intermediate table. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 24 recites: A substrate preparing device according to claim 12, wherein said substrate preparing device is a part of a resist processing apparatus.

Claim 24 is dependent from claim 12. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 12, it is respectfully submitted that claim 24 is also patentable for at least the reasons provided above with respect to claim 12. Furthermore, claim 24 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, the substrate preparing device is part of a resist processing device. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 29 recites: A device manufacturing method according to claim 10, further comprising: detecting a first position of said substrate on said intermediate table; calculating a required displacement between said first position and a desired position of the substrate on the intermediate table; and moving said substrate from said first position to said desired position.

Claim 29 is dependent from claim 10. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 10, it is respectfully submitted that claim 29 is also patentable for at least the reasons provided above with respect to claim 10. Furthermore, claim 29 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, detecting a first position of the substrate on the intermediate table; calculating a required displacement between the first position and a desired position of the substrate on the intermediate table; and moving the substrate from the first position to the desired position. Moreover, there is no motivation or suggestion to combine to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 30 recites: A device manufacturing method according to claim 10, further comprising: generating the gas bearing by delivering gas through said plurality of apertures; and evacuating said gas with a gas pump.

Claim 30 is dependent from claim 10. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 10, it is respectfully submitted that claim 30 is also patentable for at least the reasons provided above with respect to claim 10. Furthermore, claim 30 is separately patentable as neither Takizawa nor Ota

disclose or suggest, alone or in combination, generating the gas bearing by delivering gas through the plurality of aperture, and evacuating the gas with a gas pump. Moreover, there is no motivation or suggestion to combine to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

7. Claims 12 and 13 Are Patentable Over Leoff in view of Doley et al.

The March 21, 2003 Office Action, on pages 5 and 6, paragraph number 3, states "Leoff discloses all the structure set forth in the claims except for the newly added limitation of '...an ionizer constructed and arranged to ionize the gas.' However, the use of an ionizer to ionize the gas in semiconductor wafer handling system is routine in the art as is evident from the teaching of Doley (US 6,161,311) (abstract). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Leoff (US 3,603,646) by including '...an ionizer constructed and arranged to ionize the gas.' The ordinary artisan would have been motivated to modify Leoff (US 3,603,646) in the manner described above for at least the purpose of discharging the static about the intermediate table of the substrate table."

> Claim 12 recites "A substrate preparing device comprising an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus; the intermediate table comprising a major surface provided with a plurality of apertures, and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon; a first temperature controller constructed and arranged to regulate a temperature of the intermediate table; and an ionizer constructed and arranged to ionize the gas."

It is respectfully submitted that Leoff is completely silent about an ionizer constructed and arranged to ionize the gas of a gas bearing and does not disclose, teach or suggest a temperature controller constructed and arranged to regulate a temperature of the intermediate

table. By controlling the temperature of the intermediate table, the temperature of the substrate can be influenced. For example, the temperature of the intermediate table can be maintained at a temperature substantially equal to a temperature of the substrate table. Moreover, Doley is also completely silent about providing a temperature controller constructed and arranged to regulate a temperature of the intermediate table. Doley merely teaches an apparatus for reducing particles in epitaxial reactors used for epitaxial deposition of materials onto a silicon wafer. The apparatus includes lines for delivering a purge gas into a chamber handling the wafer. The purge gas is ionized with ionizers. The conductive ionized gas facilitates the discharge of particles from the wafer or surfaces of the reactor chamber. Doley does not disclose or suggest an ionizer constructed and arranged to ionize the gas of a gas bearing.

Furthermore, it is respectfully submitted that it would not have been obvious to one of ordinary skill in the art to modify Leoff by including an ionizer constructed and arranged to ionize the gas of the gas bearing. Doley is only concerned about producing defect free epitaxial growth silicon layers by reducing or eliminating the undesirable contaminate particles that may enter the semiconductor manufacturing equipment. In contrast, the invention recited in claim 12 is concerned, for example, with eliminating potential sudden discharge of the wafer in a lithographic projection apparatus. Therefore, one of skill in the art would not have been motivated to modify the ionizer of Doley and combine the modified ionizer with the wafer transport system of Leoff. Even if combined, the combination would not result in the invention of claim 12, as the combination would not include, for example, a gas bearing between the major surface of an intermediate table and a substrate located thereon and an ionizer constructed and arranged to ionize the gas. The combination thus fails to present a *prima facie* case of obviousness against claim 12.

Claim 13 recites: A substrate preparing device according to claim 12, wherein said gas bearing generator comprises: a gas source arranged to

deliver gas through the apertures to generate a gas bearing, and an evacuation pump arranged to evacuate the gas from the gas bearing.

Claim 13 is dependent from claim 12. As neither Leoff nor Doley, alone or in combination, disclose, teach or suggest the subject matter recited in claim 12, claim 13 is also not obvious over Leoff in view of Doley. Furthermore, claim 13 is separately patentable as neither Leoff nor Doley disclose or suggest, alone or in combination, the gas bearing generator comprises: a gas source arranged to deliver gas through the apertures to generate a gas bearing, and an evacuation pump arranged to evacuate the gas from the gas bearing.

8. Claims 2, 16 and 25 Are Patentable Over Takizawa in view of Ota and Doley et al.

The March 21, 2003 Office Action, on page 6, paragraph number 4, states "Takizawa and Ota discloses all the structure set forth in the claim except '...wherein said preparatory station comprises a gas ionizer constructed and arranged to ionize said gas.' However, the use of a gas ionizer to ionize gas coming in contact with a photolithographic substrate is routine in the art as is evident from the teaching of Doley et al. (U.S. 6,161,311) (see abstract, lines 19-28, of Doley). Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Takizawa (US 5,471,279) by including '...a gas ionizer constructed and arranged to ionize said gas.' The ordinary artisan would have been motivated to modify Takizawa (US 5,471,279) in the manner described above for at least the purpose of removing any static charge as described by Doley (US 6,161,311) (see abstract, lines 25-28, Doley)."

Claim 2 is dependent from claim 1, claim 16 is dependent from claim 15, and claim 25 is dependent from claim 10. For at least the reasons provided above with respect to claim 1, claim 10 and claim 15, neither Takizawa nor Ota, alone or in combination, disclose, teach

or suggest the subject matter recited in claims 2, 16 and 25. Moreover, Doley fails to overcome the deficiencies noted above with respect to Takizawa and Ota. Furthermore, Doley is only concerned about producing defect free epitaxial growth silicon layers by reducing or eliminating the undesirable contaminate particles that may enter the semiconductor manufacturing equipment. In contrast, the invention recited in claims 2, 16 and 25 is concerned, for example, about eliminating potential sudden discharge of the wafer in a lithographic projection apparatus. Therefore, one of skill in the art would not have been motivated to modify Takizawa to include the ionizer of Doley, which ionizes purge gas, not the gas of a bearing, and even if combined would not result in the subject matter recited in claims 2, 16 and 25.

9. Claims 3, 5, 6, 15, 20-22 and 26-28 Are Patentable Over Takizawa in view of Ota and Tsutsui

The March 21, 2003 Office Action, on page 7, paragraph number 5, states "Regarding claims 3, 20 and 26, Takizawa (US 5,471,279) and Ota (US 6,228,544) discloses all the structure set forth in the claims except '...wherein said intermediate table comprises a first temperature controller constructed and arranged to regulate a temperature of the intermediate table.' However, the use of a temperature controller constructed and arranged to regulate a temperature of a table which hold a substrate is routine in the art as is evident from the teaching of Tsutsui (US 4,720,732) (see abstract, lines 8-13, Tsutsui). Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Takizawa (US 5,471,279) by '...wherein said intermediate table comprises a first temperature controller constructed and arranged to regulate a temperature of the intermediate table.' The ordinary artisan would have been motivated to modify Takizawa (US 5,471,279) in the manner described above so that the reliability of alignment between the pattern of the

mask and the pattern formed on the wafer is improved as described by Tsutsui (see abstract, lines 14-17, Tsutsui)."

"Regarding claims 5, 22 and 27, a further difference between modified Takizawa (US 5,471,279) and the claimed invention is '...wherein said preparatory station comprises a second temperature controller constructed and arranged to regulate the temperature of the gas.' However, Tsutsui (US 4,720,732) discloses a temperature controller (Fig. 1, ref.# 8, Tsutsui) to control the temperature of air flowing into the substrate table. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Takizawa (US 5,471,279) by '...wherein said preparatory station comprises a second temperature controller constructed and arranged to regulate the temperature of said gas.' The ordinary artisan would have been motivated to modify Takizawa (US 5,471,279) in the manner described above to help maintain the same temperature between the substrate and the substrate table so that the reliability of alignment between the pattern of the mask and the pattern formed on the wafer is improved as described in Tsutsui (US 4,720,732) (see abstract, lines 14-17, Tsutsui)."

It is respectfully noted that claim 3 is dependent from claim 1, and claim 26 is dependent from claim 10. Claim 20 has been cancelled without prejudice or disclaimer. For at least the reasons presented above with respect to claims 1 and 10, claims 3 and 26 are not obvious over Takizawa and Ota. Moreover, Tsutsui fails to overcome the deficiencies noted above in Takizawa and Ota as Tsutsui fails to disclose or suggest "the intermediate table comprising a major surface provided with a plurality of apertures; and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon," as recited in claim 1 or "providing the substrate to an intermediate table comprising a major surface provided with a plurality of apertures, and maintaining the

substrate for a given time interval upon a gas bearing generated between the major surface and the substrate," as recited in claim 10. Therefore, claims 3 and 26 are not obvious over Takizawa and Ota in view of Tsutsui.

With regard to claims 5, 22 and 27, it is respectfully noted that claim 5 is dependent from claim 1, claim 22 is dependent from claim 12 and claim 27 is dependent from claim 10. For at least the reasons presented above with respect to claims 1, 10 and 12, it is respectfully submitted that claims 5, 22 and 27 are not obvious over Takizawa and Ota. Moreover, Tsutsui fails to overcome the deficiencies noted above in Takizawa and Ota as Tsutsui fails to disclose or suggest "the intermediate table comprising a major surface provided with a plurality of apertures; and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon," as recited in claim 1 or "providing the substrate to an intermediate table comprising a major surface provided with a plurality of apertures, and maintaining the substrate for a given time interval upon a gas bearing generated between the major surface and the substrate," as recited in claim 10 or "an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus; the intermediate table comprising a major surface provided with a plurality of apertures, and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon," as recited in claim 12. Therefore, Claims 5, 22 and 27 are not obvious over Takizawa and Ota in view of Tsutsui.

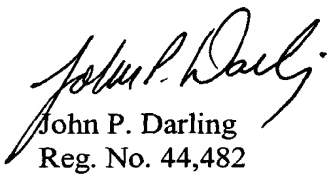
VI. CONCLUSION

For at least the reasons discussed above, it is respectfully submitted that claims 1, 4, 7, 8-15, 17-19, 23, 24, 29 and 30 are patentable over Takizawa in view of Ota, claims 12 and

13 are patentable over Leoff in view of Doley et al., claims 2, 16 and 25 are patentable over Takizawa and Ota as applied to claim 1 and further in view of Doley et al., and claims 3, 5, 6, 15, 20-22 and 26-28 are patentable over Takizawa and Ota as applied to claim 1 and further in view of Tsutsui.

For the above reasons, Appellant respectfully requests this Honorable Board to reverse the rejection of the claims.

Respectfully submitted,
PILLSBURY WINTHROP LLP



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VII. APPENDIX

1. A lithographic projection apparatus, comprising:

a radiation system constructed and arranged to supply a projection beam of radiation;

a mask table provided with a mask holder constructed and arranged to hold a substrate;

a substrate table provided with a substrate holder constructed and arranged to hold a substrate;

a projection system constructed and arranged to image an irradiated portion of the mask onto a target portion of the substrate;

a preparatory station comprising an intermediate table on which a substrate can be positioned before transfer to the substrate table,

the intermediate table comprising a major surface provided with a plurality of apertures; and

a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon.

2. An apparatus according to claim 1, wherein said preparatory station comprises a gas ionizer constructed and arranged to ionize said gas.

3. An apparatus according to claim 1, wherein said intermediate table comprises a first temperature controller constructed and arranged to regulate a temperature of the intermediate table.

4. An apparatus according to claim 1, wherein said gas bearing has a thickness less than 150 μm.

5. An apparatus according to claim 1 wherein said preparatory station comprises a temperature controller constructed and arranged to regulate a temperature of said gas.

6. An apparatus according to claim 3, wherein said first temperature controller maintains the intermediate table and the gas at a temperature substantially equal to a temperature of the substrate table.

7. An apparatus according to claim 1, wherein said apparatus further comprises:

a position detector constructed and arranged to detect a first position of said substrate on said intermediate table;

a displacement calculator for calculating a required displacement between said first position and a desired position of the substrate on the intermediate table; and

an actuator constructed and arranged to move said substrate from said first position to said desired position.

8. An apparatus according to claim 7, wherein said position detector is constructed and arranged to detect an edge of the substrate.

9. An apparatus according to claim 7, wherein said position detector is constructed and arranged to detect a mark on a substrate.

10. A device manufacturing method comprising:

(a) providing a mask table with a mask which contains a pattern,

(b) providing a substrate table with a substrate which is at least partially covered by a layer of radiation-sensitive material,

(c) prior to (b), providing the substrate to an intermediate table comprising a major surface provided with a plurality of apertures, and maintaining the substrate for a given time interval upon a gas bearing generated between the major surface and the substrate; and

(d) using a projection beam of radiation to project an irradiated part of the mask onto a target area of the layer of radiation-sensitive material.

11. A device manufactured in accordance with a method as claimed in claim 10.

12. A substrate preparing device comprising an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus;

the intermediate table comprising a major surface provided with a plurality of apertures, and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon;

a first temperature controller constructed and arranged to regulate a temperature of the intermediate table; and

an ionizer constructed and arranged to ionize the gas.

13. A substrate preparing device according to claim 12, wherein said gas bearing generator comprises:

a gas source arranged to deliver gas through the apertures to generate a gas bearing, and

an evacuation pump arranged to evacuate the gas from the gas bearing.

14. An apparatus according to claim 7, wherein said gas bearing generator comprises:

a gas source arranged to deliver gas through the apertures to generate the gas bearing, and

an evacuation pump arranged to evacuate the gas from the gas bearing.

15. A substrate preparing device comprising:

an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus, the intermediate table comprising a major surface provided with a plurality of apertures;

a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon; and

a temperature controller constructed and arranged to regulate a temperature of at least one of the intermediate table and the temperature of the gas.

16. A substrate preparing device according to claim 15, further comprising:

a gas ionizer constructed and arranged to ionize said gas bearing.

17. A substrate preparing device according to claim 15, further comprising:

a position detector constructed and arranged to detect a first position of said substrate on said intermediate table;

a displacement calculator constructed and arranged to calculate a required displacement between said first position and a desired position of the substrate on the intermediate table; and

an actuator constructed and arranged to move said substrate from said first position to said desired position.

18. A substrate preparing device according to claim 15, wherein said gas bearing generator comprises:

a gas source arranged to deliver gas through said plurality of apertures to generate the gas bearing; and

an evacuation pump arranged to evacuate the gas from the gas bearing.

19. A substrate preparing device according to claim 15, wherein said substrate preparing device is a part of a resist processing apparatus.

21. A substrate preparing device according to claim 12,

wherein said first temperature controller maintains the intermediate table and the gas bearing at a temperature substantially equal to a temperature of the substrate table.

22. A substrate preparing device according to claim 12,

wherein said intermediate table further comprises a second temperature controller constructed and arranged to regulate a temperature of said gas bearing.

23. A substrate preparing device according to claim 12, further comprising:

a position detector constructed and arranged to detect a first position of said substrate on said intermediate table;

a displacement calculator constructed and arranged to calculate a required displacement between said first position and a desired position of the substrate on the intermediate table; and

an actuator constructed and arranged to move said substrate from said first position to said desired position.

24. A substrate preparing device according to claim 12, wherein said substrate preparing device is a part of a resist processing apparatus.

25. A device manufacturing method according to claim 10, further comprising:
ionizing said gas bearing with a gas ionizer.

26. A device manufacturing method according to claim 10, further comprising:
regulating a temperature of said intermediate table with a first temperature controller.

27. A device manufacturing method according to claim 10, further comprising:
regulating a temperature of said gas bearing with a second temperature controller.

28. A device manufacturing method according to claim 10, further comprising:
maintaining said intermediate table and the gas bearing at a temperature substantially equal to a temperature of the substrate table.

29. A device manufacturing method according to claim 10, further comprising:
detecting a first position of said substrate on said intermediate table;
calculating a required displacement between said first position and a desired position of the substrate on the intermediate table; and
moving said substrate from said first position to said desired position.

30. A device manufacturing method according to claim 10, further comprising:
generating the gas bearing by delivering gas through said plurality of apertures; and
evacuating said gas with a gas pump.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND INTERFERENCES

In re PATENT APPLICATION of:

SEGERS *et al.*

Group Art Unit: 2851

Appln. No.: 09/552,672

Examiner: Fuller, Rodney Evan

Filed: April 19, 2000

Title: LITHOGRAPHIC PROJECTION APPARATUS

BRIEF ON APPEAL

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Date: August 28, 2003

TABLE OF CONTENTS

I. INTRODUCTION

This Appeal is from an Office Action mailed March 21, 2003, finally rejecting claims 1-30.

A. Real Party in Interest

The real party in interest for this Appeal and the present application is ASML NETHERLANDS B.V., by way of an Assignment to LITHOGRAPHY B.V. recorded in the U.S. Patent and Trademark Office at Reel/Frame 010736/0878 on April 19, 2000 and a name change to ASML Netherlands B.V. recorded in the U.S. Patent and Trademark Office at Reel/Frame 012735/0001 on March 28, 2002.

B. Statement of Related Appeals and Interferences

There are presently no appeals or interferences known to Appellant, Appellant's representatives or the Assignee, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

C. Status of Claims

Claims 1-19 and 21-30 are pending. Claims 1-19 and 21-30 stand rejected and are on appeal. Claims 1, 10, 12 and 15 are independent. Claims 2-9 and 14 are dependent directly or indirectly from claim 1; claims 11 and 25-30 are dependent from claim 10; claims 13 and 21-24 are dependent from claim 12; and claims 16-19 are dependent from claim 15.

D. Status of Amendments

A Preliminary Amendment was filed April 19, 2000. An Amendment under 37 C.F.R. § 1.111 was filed July 17, 2002 in reply to an April 17, 2002 Office Action. An Amendment under 37 C.F.R. §1.111 was filed January 15, 2003 in response to an October 22, 2002 Office Action. An Amendment After Final under 37 C.F.R. §1.116 was filed June 23, 2003 in response to a Final Rejection dated March 21, 2003. The Amendment After Final Rejection canceled claim 20, amended claim 21 to depend from claim 12 and amended claim

12 to include the limitation recited in claim 20. An Advisory Action dated July 8, 2003 granted entry of the Amendment for purpose of Appeal. All claim amendments of record have been entered.

II. SUMMARY OF THE INVENTION

A. Related Art Problems Overcome by the Invention

In conventional lithographic apparatuses, a substrate is held on a substrate table firmly in a fixed position during an exposure process. The substrate is conventionally held in the fixed position by applying a vacuum to a major surface of the substrate table. The vacuum sucks the substrate firmly to substrate table. Prior to positioning the substrate on the substrate table, the substrate will often be processed (for example, spin-coated with a resist) in a process track. Therefore, the temperature of the substrate can be different from the temperature of the substrate table. This can lead to problems. For example, the temperature of the substrate table can change after the substrate is positioned on the substrate table and the substrate table can cool the substrate. The cooling of the substrate causes the substrate to shrink.

However, because the substrate is being held firmly by the substrate holder, the substrate does not have the same freedom to shrink as would be the case if it were not held. The substrate can only shrink when the tension inside the substrate is higher than the friction between the substrate and the surface of the substrate table. If this occurs, a portion of the substrate will slip over the surface of the substrate table to release the tension inside the substrate. This slip movement can lead to errors in super-positioning two images exposed on successive layers on the substrate which can lead to so-called overlay error. In general, the super-positioning of two images is accurately achieved by aligning a mark on the substrate to a reference mark (for example, a reference mark on the mask, or a fiducial mark on the

substrate table). In the event the substrate slips after aligning the substrate to the reference mark, the super-positioning of two images on the slip part of the substrate can fail. Similarly, if the substrate is colder than the substrate table and is warmed by the substrate table, the substrate would tend to expand and thus can also slip over the surface of the substrate table.

B. Aspects of the Invention

An aspect of the invention is to provide a lithographic apparatus comprising, *inter-alia*, a substrate table provided with a substrate holder constructed and arranged to hold a substrate and a preparatory station comprising an intermediate table on which a substrate can be positioned before transfer to the substrate table. The intermediate table comprises a major surface provided with a plurality of apertures and a gas bearing generator constructed and arranged to generate a gas bearing between the major surface and a substrate located on the major surface. The gas bearing substantially removes the friction between the substrate and the major surface of the intermediate table. In this way, the substrate can, for example, easily expand and shrink on the gas bearing when the temperature of the substrate changes. In addition, the gas bearings can eliminate contamination of the backside of the substrate by foreign particles. In some instances, particles already collected on the backside of the substrate may even be blown away from the backside by the gas bearing.

C. Embodiment 1 of the Invention

Figure 1 schematically depicts a lithographic projection apparatus including a radiation system LA, Ex, IN, CO for supplying a projection beam of radiation PB, a mask table MT provided with a mask holder to hold mask MA, a substrate table WT provided with a substrate holder to hold substrate W, and a projection system PL. The beam PB intercepts the mask MA. The beam PB then passes through the projection system PL which focuses the beam PB onto a target C of the substrate W. (Page 7, line 31 through page 9, line 10.)

D. Embodiment 2 of the Invention

Referring to Figure 2a, a preparatory station includes an intermediate table 5 comprising a gas chamber 7 connected via apertures 9 to a major surface 11. A substrate (wafer) 1 having an edge 3, a front side 1a and a backside 1b can be deposited on the intermediate table 5. The preparatory station further includes a rotation unit 15 comprising an actuator 17 and a vacuum holder 19 for holding and rotating the substrate 1 above the intermediate table 5. The preparatory station also comprises a gas bearing comprising a gas source 21 for supplying a gas to the major surface 11 via the apertures 9, the gas chamber 7 and a tube 23. A detector 25 includes an edge detector 27 for detecting the edge 3 of substrate 1 and a mark detector 29 for detecting a mark on the front side 1a of substrate 1. (Page 9, lines 15-27.)

A substrate transporter holds the substrate 1 above the major surface 11 and the vacuum holder 19 will be moved by the actuator 17 towards the major surface 11 up to the backside 1b of the substrate 1. A vacuum is applied to the vacuum holder 19 such that the backside 1b is sucked to the vacuum holder 19. The substrate transporter is then released from the backside 1b of substrate 1 and moved away from the major surface 11. The actuator 17 retracts the vacuum holder 19 toward the major surface 11 and a gas is supplied to the surface 11 by the gas source 21 via tube 23, the gas chamber 7 and the apertures 9. The gas, thus, creates a gas bearing between the substrate 1 and the major surface 11. (Page 9, line 28 through page 10, line 7.)

As shown in Figure 2b, the gas source 21 can comprise a pump 31, a gas ionizer 33, a second controller 35 for temperature control of the gas, a gas filter 37 and an air inlet 39. The gas ionizer 33 ionizes the gas used to create the gas bearing. The ions in the gas will be

attracted by any static charge collected on the backside 1b of the substrate 1 and will neutralize such charge. (Page 10, lines 8-18.)

The intermediate table 5 can comprise a first controller constructed and arranged to control the temperature of intermediate table 5. By controlling the temperature of the intermediate table 5, the temperature of the substrate 1 can be influenced. One mechanism of influencing the temperature of the substrate 1 can be by thermal radiation between the substrate 1 and the surface 11. Another mechanism of influencing the temperature of the substrate 1 can be that the temperature of the intermediate table 5 influences the temperature of the gas used in the gas bearing, and the temperature of the gas influences the temperature of the substrate 1. In particular, when the gap caused by the gas bearing between the substrate 1 and the surface 11 is thin, for example, less than 150 μm, the temperature of the intermediate table 5 can have a strong and rapid influence on the temperature of the substrate. (Page 10, lines 19-27.)

The first and/or the second controller can maintain the intermediate table 5 and the gas at a temperature substantially equal to the temperature of the substrate table WT. For example, one could employ a sensor to measure the temperature of the substrate table WT and one could regulate the temperature in the first and/or second controller such that the temperature is substantially equal to the measured temperature. This allows the temperature of the substrate to be equal to the temperature of the substrate table before transfer. Thus, substantially no shrinkage or expansion of the substrate would occur after placement of the substrate on the substrate table WT. (Page 10, line 28 through page 11, line 3).

In measuring the orientation of the substrate 1 on the intermediate table 5, the mark detector 29 can be used to detect a mark on the from side of the substrate 1a, and/or the edge detector 27 can be used to detect the edge 3 of the substrate 1. The edge detector 27

measures the eccentricity of the substrate 1 on the intermediate table 5. This is accomplished by actuator 17 which rotates the vacuum holder 19 around an axis perpendicular to the plane of the intermediate table such that edge 3 of the substrate 1 rotates underneath the edge detector 27 (Figure 2c, which shows a plan view of the intermediate table 5 without a substrate positioned thereon). The edge detector can emply a capacitive sensor or an optical sensor. In this way a notch or flat edge can be automatically oriented as desired, before substrate 1 is transferred to the substrate table WT, and the eccentricity of the substrate can be measured and determined if the substrate falls outside the capture range of the alignment module employed at the substrate table WT. If the first position of the substrate 1 on the intermediate table is not within the capture range of the alignment module, one would like to reposition the substrate on the intermediate table, otherwise the substrate cannot be accurately transferred to the required position on the substrate table WT for exposure. For this positioning, the intermediate table 5 is provided with a movable portion 41 comprising second vacuum holder 43 which can be sucked against backside 1b of substrate 1, and a displacer 45 for moving the second holder 43. If the substrate 1 is not in the desired in-plane position on the intermediate table 5 , the substrate 1 on the intermediate table will be rotated such that the center of the substrate 1 and the center of the holder 19 will be in one straight line with the movable portion 41. Subsequently, the second holder 43 will be sucked to the backside 1b of the substrate 1 and the vacuum in the holder 19 will be released. The second holder 43 will be moved by the displacer 45, to or away from the center of the holder 19, such that after release of the vacuum in the second holder 43, the substrate 1 will have the required in-plane position. In the required position the center of the substrate 1 will be substantially at the same position as the center of the holder 19. If necessary more than one movable portion 41 can be used. (Page 11, line 4 through page 12, line 3.)

E. Embodiment 3 of the Invention

Referring to Figure 3, the gas source 21 delivers gas through tube 23, the gas chamber 7 and the apertures 9 to the gas bearing. The gas in the gas bearing is evacuated through evacuation apertures 49 and the evacuation tube 51 to an evacuation pump 47. Any foreign particles present on the backside 1b of the substrate 1 can be evacuated to the evacuation pump 47. If the evacuation pump were not present, foreign particles could be blown off the backside of the substrate 1 into the apparatus where the foreign particles could cause contamination problems. Another advantage of evacuating the gas is the ability to control the thickness of the gas bearing if the inflow and the evacuation of gas are controlled. The evacuated gas can be returned to gas source 21, such that after filtering the gas it can be reused in the gas bearing. (Page 12, lines 4-14.)

F. Embodiment 4 of the Invention

Referring to Figure 4, the gas bearing is relatively thick (i.e. larger than 150 μm). Gas is supplied to the gas bearing from the gas source 21 through tube 23, the gas chamber 7 and the apertures 9. If such a gas bearing is used, the gas source 21 will advantageously be equipped with a second controller for directly controlling the temperature of the gas.

III. ISSUES AND REJECTIONS

The March 21, 2003 Office Action rejects claims 1, 4, 7, 8-15, 17-19, 23, 24, 29 and 30 under 35 U.S.C. §103(a) over Takizawa (U.S. Patent 5,471,279) in view of Ota (U.S. Patent 6,228,544); rejects claims 12 and 13 under 35 U.S.C. §103(a) over Leoff (U.S. Patent No. 3,603,646) in view of Doley et al. (U.S. Patent No. 6,161,311); rejects claims 2, 16 and 25 under 35 U.S.C. §103(a) over Takizawa in view of Ota and Doley et al.; rejects claims 3, 5, 6, 15, 20-22 and 26-28 under 35 U.S.C. §103(a) over Takizawa in view of Ota and Tsutsui (U.S. Patent No. 4,720,732).

Appellant notes that claim 15 was rejected under both Takizawa in view of Ota and Takizawa in view of Ota and Tsutsui. Claim 15 is patentable over both combinations and will be separately argued below.

Thus, the issues on appeal are whether: (1) claims 1, 4, 7, 8-15, 17-19, 23, 24, 29 and 30 are patentable over Takizawa in view of Ota, (2) claims 12 and 13 are patentable over Leoff in view of Doley et al., (3) claims 2, 16 and 25 are patentable over Takizawa in view of Ota and Doley et al., and (4) claims 3, 5, 6, 15, 20-22 and 26-28 are patentable over Takizawa in view of Ota and Tsutsui.

IV. GROUPING OF CLAIMS

Each claim of this patent application is separately patentable and upon issuance of a patent will be entitled to a separate presumption of validity under 35 U.S.C. §282. For convenience in handling of this Appeal, the claims are grouped as follows:

Group I, claims 1-9 and 14;

Group II, claims 10-11 and 25-30;

Group III, claims 12-13 and 21-24; and

Group IV, claims 15-19.

Each of Groups I through IV will be argued separately in the following arguments. The groups do not stand or fall together. In addition, the claims within each Group do not stand or fall together and are argued separately in the following arguments.

V. ARGUMENT

A. The Law Regarding Factual Inquiries to Determine Obviousness/Non-Obviousness

Several basis factual inquiries must be made to determine obviousness or non-obviousness of patent application claims under 35 U.S.C. § 103. These factual inquiries are set forth in Graham v. John Deere Co., 383 US 1, 17, 148 USPQ 459, 467 (1966);

> Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or non-obviousness of the subject matter is determined.

As stated by the Federal Court in In re Ochiai, 37 USPQ 2d 1127, 1131 (Fed. Cir. 1995);

> [T]he test of obviousness *vel non* is statutory. It requires that one compare the claim's subject matter as a whole with the prior art to which the subject matter pertains. 35 U.S.C. § 103. The inquiry is thus highly fact-specific by design . . . When the references cited by the Examiner fail to establish a *prima facie* case of obviousness, the rejection is improper and will be overturned. In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988) (Emphasis added).

In rejecting claims under 35 U.S.C. § 103(a), an Examiner bears an initial burden of presenting a *prima facie* case of obviousness. A *prima facie* case of obviousness is established only if there is a suggestion or motivation to combine reference teachings; a reasonable expectation of success; and the prior art references, when combined, teach or suggest all the claim limitations. If an Examiner fails to establish a *prima facie* case, a rejection is improper and will be overturned. See In re Rijckaert, 9 F.3d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993). "If examination . . . does not produce a *prima facie* case of unpatentability, then without more, the Applicant is entitled to the grant of the patent." In re Oetiker, 977 F.2d 1443, 1445-1446, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).

B. Rejections Under 35 U.S.C. § 103(a)

1. Takizawa

Takizawa discloses a substrate supporting apparatus having a float chuck 1 and a base chuck 2. Pressurized air is supplied between the float chuck and the base chuck to float the float chuck. The substrate is attracted to a surface of the float chuck with a vacuum attraction force. The float chuck 1 is attracted to or floated on the surface of the base chuck 2 by a vacuum attraction force or pressurized air supplied from the evacuation/supply line (see col. 4, lines 56-58 in Takizawa). As clearly stated in col. 6, lines 8-15 of Takizawa, the substrate is attracted to the float chuck 1 and the floating force of the pressurized air does not act on the substrate directly.

2. Ota

Ota discloses a temperature adjustment plate 20 for cooling a substrate 9 before transporting the substrate 9 onto a substrate stage 8. The temperature adjustment plate has a substrate lifting device 21 which has spindles 21a-21c having holes at the tip to support the substrate 9 through vacuum absorption (suction). The spindles 21a-21c are vertically moved by driving device 23 (see col. 6, lines 55-64) to lift the substrate 9.

3. Leoff

Leoff discloses a gravity-type air slide allowing self-controlled spacing of a plurality of articles which are gravity fed along the transport path in sequence. The gravity-type air slide employs at least one vacuum braking or hold member which lies in juxtaposition to the path of movement of the articles. When the moving article overlies the hold member there is an increase in vacuum within the hold member. The air slide 10 comprises manifold 12 in the form of an imperforate casing 14 supporting a porous planar member 16. Air enters the manifold 12 through a conduit 18 creating a film of air on the outer surface 20 of the porous member 16 which supports an article such as wafer 22 (see col. 2, lines 36-50). A vacuum

tube constituting a vacuum hold is embedded into the porous member 16 of the air slide such that an open end 28 of the vacuum tube lies just beneath the surface 20.

4. Doley

Doley discloses an apparatus for reducing particles in epitaxial reactors used for epitaxial deposition of materials onto a silicon wafer. The apparatus includes lines for delivering a purge gas into a chamber handling the wafer. The purge gas is ionized with ionizers. The conductive ionized gas facilitates the discharge of particles from the wafer or surfaces of the reactor chamber. By removal of the static charge, particles and wafers are no longer attracted to each other by electrostatic force.

5. Tsutsui

Tsutsui discloses a transfer apparatus for transferring a pattern of a mask onto a wafer. The apparatus includes a wafer chuck for holding the wafer. The temperature of the wafer held by the wafer chuck is controlled to expand/contract the wafer to achieve alignment of the pattern of the mask with a pattern formed on the wafer. Within the wafer chuck is provided a cavity through which a thermo-regulated fluid such as heated air flows.

6. Claims 1, 4, 7, 8-15, 17-19, 23, 24, 29 and 30 Are Patentable Over Takizawa in view of Ota

The March 21, 2003 Office Action, on page 4, paragraph number 2, states "Takizawa discloses all the structure set forth in the claims except for the limitation as argued by the Applicant of '...an intermediate table on which a substrate can be positioned before transfer to the substrate table.' However, the use of an intermediate table on which a substrate can be positioned before transfer to the substrate table is routine in the art as evident from the teaching of Ota (US 6,228,544) (Fig. 1, ref.# 20). Thus, it would have been obvious to one of

ordinary skill in the art at the time the invention was made to modify Takizawa (US 5,471,279) by including an intermediate table on which a substrate can be positioned before transfer to the substrate table. The ordinary artisan would have been motivated to modify Takizawa (US 5,471,279) in the manner described above for at least the purpose of removing a quantity of heat corresponding to a heat accumulation on the substrate stage during exposure as described by Ota (US 6,228,544) (abstract)."

> Claim 1 recites: A lithographic projection apparatus, comprising: a radiation system constructed and arranged to supply a projection beam of radiation; a mask table provided with a mask holder constructed and arranged to hold a substrate; a substrate table provided with a substrate holder constructed and arranged to hold a substrate; a projection system constructed and arranged to image an irradiated portion of the mask onto a target portion of the substrate; a preparatory station comprising an intermediate table on which a substrate can be positioned before transfer to the substrate table, the intermediate table comprising a major surface provided with a plurality of apertures; and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon.

It is respectfully submitted that Takizawa merely discloses a substrate supporting apparatus having a float chuck and a base chuck. Pressurized air is supplied between the float chuck and the base chuck and not between the substrate and the float chuck. The pressurized air serves to float the float chuck. The substrate is attracted to a surface of the float chuck by a vacuum attraction force (suction). As clearly stated in col. 6, lines 8-15 of Takizawa, the substrate is attracted to the float chuck and the floating force of the pressurized air does not act on the substrate. Therefore, Takizawa fails to disclose, teach or suggest an intermediate table comprising a major surface provided with a plurality of apertures, and Takizawa also fails to disclose, teach or suggest a gas bearing generator constructed and arranged to generate a gas bearing between the major surface and a substrate located thereon.

In addition, it is respectfully submitted that Ota merely discloses a temperature adjustment plate 20 for cooling a substrate 9 before transporting the substrate 9 onto a

substrate stage 8. The temperature adjustment plate has spindles 21a-21c having holes at the tip to support the substrate 9 through vacuum absorption (suction). Thus Ota does not disclose, teach or suggest a gas bearing generator constructed and arranged to generate a gas bearing between the major surface and a substrate located thereon.

As neither Takizawa nor Ota discloses or suggests a gas bearing generator constructed and arranged to generate a gas bearing between the major surface of an intermediate table and a substrate located thereon, the combination fails to include all the limitations of claim 1 and fails to present a *prima facie* case of obviousness against claim 1. See MPEP § 2141. Accordingly, even assuming *arguendo* it would have been obvious to modify Takizawa by including a temperature adjustment plate as taught by Ota, one would still not obtain "the intermediate table comprising a major surface provided with a plurality of apertures; and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon," as recited in claim 1. Moreover, there is no motivation or suggestion to modify Takizawa by including "the intermediate table" of Ota.

> Claim 10 recites: A device manufacturing method comprising: (a) providing a mask table with a mask which contains a pattern, (b) providing a substrate table with a substrate which is at least partially covered by a layer of radiation-sensitive material, (c) prior to (b), providing the substrate to an intermediate table comprising a major surface provided with a plurality of apertures, and maintaining the substrate for a given time interval upon a gas bearing generated between the major surface and the substrate; and (d) using a projection beam of radiation to project an irradiated part of the mask onto a target area of the layer of radiation-sensitive material.

For at least the reasons discussed above with respect to claim 1, neither Takizawa nor Ota, alone or in combination, disclose, teach or suggest "providing the substrate to an intermediate table comprising a major surface provided with a plurality of apertures, and maintaining the substrate for a given time interval upon a gas bearing generated between the major surface and the substrate," as recited in claim 10.

Claim 10 is also separately patentable as neither Takizawa nor Ota disclose or suggest maintaining the substrate for a given time interval upon a gas bearing generated between the major surface and the substrate. Furthermore, there is no motivation or suggestion for combining the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 12 recites: A substrate preparing device comprising an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus; the intermediate table comprising a major surface provided with a plurality of apertures, and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon; a first temperature controller constructed and arranged to regulate a temperature of the intermediate table; and an ionizer constructed and arranged to ionize the gas.

For at least the reasons discussed above with respect to claim 1, neither Takizawa nor Ota, alone or in combination, disclose, teach or suggest "an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus; the intermediate table comprising a major surface provided with a plurality of apertures, and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon," as recited in claim 12.

Furthermore, claim 12 is separately patentable as neither Takizawa nor Ota disclose or suggest an ionizer constructed and arranged to ionize the gas of the gas bearing. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 15 recites: A substrate preparing device comprising: an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus, the intermediate table comprising a major surface provided with a plurality of apertures; a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon; and a temperature controller constructed and arranged to regulate a temperature of at least one of the intermediate table and the temperature of the gas.

For at least the reasons discussed above with respect to claim 1, neither Takizawa nor Ota, alone or in combination, disclose, teach or suggest "an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus, the intermediate table comprising a major surface provided with a plurality of apertures; a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon," as recited in claim 15.

Furthermore, claim 15 is separately patentable as there is no motivation or suggestion in either Takizawa or Ota, to modify Takizawa to include the temperature-adjustment plate of Ota. Therefore, neither Takizawa nor Ota disclose or suggest, alone or in combination, the subject matter recited in claim 15. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

Therefore, Appelant respectfully submits that the March 21, 2003 Office Action fails to establish a *prima facie* case of obviousness against independent claims 1, 10, 12 and 15.

> Claim 4 recites: An apparatus according to claim 1, wherein said gas bearing has a thickness less than 150 μm.

Claim 4 is dependent from claim 1. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 1, it is respectfully submitted that claim 4 is also patentable for at least the reasons provided in claim 1. Furthermore, claim 4 is separately patentable as neither Takizawa nor Ota disclose or suggest a gas bearing having a thickness less than 150 μm. Indeed, although pressurized air is supplied between the float chuck and the base chuck to float the float chuck in Takizawa, Takizawa, however, does not disclose anywhere the thickness of the pressurized air and as

stated previously Takizawa merely supplies pressurized air between the float chuck and the base chuck, not between the substrate and the float chuck.

> Claim 7 recites: An apparatus according to claim 1, wherein said apparatus further comprises: a position detector constructed and arranged to detect a first position of said substrate on said intermediate table; a displacement calculator for calculating a required displacement between said first position and a desired position of the substrate on the intermediate table; and an actuator constructed and arranged to move said substrate from said first position to said desired position.

Claim 7 is dependent from claim 1. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 1, it is respectfully submitted that claim 7 is also patentable for at least the reasons provided above with respect to claim 1. Furthermore, claim 7 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, a position detector constructed and arranged to detect a first position of the substrate on the intermediate table; a displacement calculator for calculating a required displacement between the first position and a desired position of the substrate on the intermediate table; and an actuator constructed and arranged to move the substrate from the first position to said desired position. Moreover, the is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 8 recites: An apparatus according to claim 7, wherein said position detector is constructed and arranged to detect an edge of the substrate.

Claim 8 is indirectly dependent from claim 1. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 1, it is respectfully submitted that claim 8 is also patentable for at least the reasons provided above with respect to claim 1. In addition, as claim 8 is dependent from claim 7, claim 8 is also patentable for at least the reason provided above in claim 7. Furthermore, claim 8 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in

combination, the position detector constructed and arranged to detect an edge of the substrate. Moreover, there is no motivation or suggestion to combine to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 9 recites: An apparatus according to claim 7, wherein said position detector is constructed and arranged to detect a mark on a substrate.

Claim 9 is indirectly dependent from claim 1. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 1, it is respectfully submitted that claim 9 is also patentable for at least the reasons provided above with respect to claim 1. In addition, as claim 9 is dependent from claim 7, claim 8 is also patentable for at least the reason provided above with respect to claim 7. Furthermore, claim 9 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, the position detector constructed and arranged to detect a mark on a substrate.

> Claim 11 recites: A device manufactured in accordance with a method as claimed in claim 10.

Claim 11 is dependent from claim 10. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 10, it is respectfully submitted that claim 11 is also patentable for at least the reasons provided above with respect to claim 10. Furthermore, claim 11 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, a device manufactured in accordance with the method recited in claim 10. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 13 recites: A substrate preparing device according to claim 12, wherein said gas bearing generator comprises: a gas source arranged to deliver gas through the apertures to generate a gas bearing, and an evacuation pump arranged to evacuate the gas from the gas bearing.

Claim 13 is dependent from claim 12. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 12, it is respectfully

submitted that claim 13 is also patentable for at least the reasons provided above with respect to claim 12. Furthermore, claim 13 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, the gas bearing generator comprises a gas source arranged to deliver gas through the apertures to generate a gas bearing and an evacuation pump arranged to evacuate the gas from the gas bearing. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 14 recites: An apparatus according to claim 7, wherein said gas bearing generator comprises: a gas source arranged to deliver gas through the apertures to generate the gas bearing, and an evacuation pump arranged to evacuate the gas from the gas bearing.

Claim 14 is indirectly dependent from claim 1. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 1, it is respectfully submitted that claim 14 is also patentable for at least the reasons provided above with respect to claim 1. In addition, as claim 14 is dependent from claim 7, claim 14 is also patentable for at least the reason provided above in claim 7. Furthermore, claim 14 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, the gas bearing generator comprises a gas source arranged to deliver gas through the apertures to generate the gas bearing, and an evacuation pump arranged to evacuate the gas from the gas bearing. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 17 recites: A substrate preparing device according to claim 15, further comprising: a position detector constructed and arranged to detect a first position of said substrate on said intermediate table; a displacement calculator constructed and arranged to calculate a required displacement between said first position and a desired position of the substrate on the intermediate table; and an actuator constructed and arranged to move said substrate from said first position to said desired position.

Claim 17 is dependent from claim 15. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 15, it is respectfully submitted that claim 17 is also patentable for at least the reasons provided above with respect to claim 15. Furthermore, claim 17 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, a position detector constructed and arranged to detect a first position of the substrate on the intermediate table; much less a displacement calculator constructed and arranged to calculate a required displacement between the first position and a desired position of the substrate on the intermediate table. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 18 recites: A substrate preparing device according to claim 15, wherein said gas bearing generator comprises: a gas source arranged to deliver gas through said plurality of apertures to generate the gas bearing; and an evacuation pump arranged to evacuate the gas from the gas bearing.

Claim 18 is dependent from claim 15. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 15, it is respectfully submitted that claim 18 is also patentable for at least the reasons provided above with respect to claim 15. Furthermore, claim 18 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, the gas bearing generator comprises: a gas source arranged to deliver gas through the plurality of apertures to generate the gas bearing; and an evacuation pump arranged to evacuate the gas from the gas bearing. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 19 recites: A substrate preparing device according to claim 15, wherein said substrate preparing device is a part of a resist processing apparatus.

Claim 19 is dependent from claim 15. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 15, it is respectfully submitted that claim 19 is also patentable for at least the reasons provided above with respect to claim 15. Furthermore, claim 19 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, the substrate preparing device is a part of a resist processing apparatus. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 23 recites: A substrate preparing device according to claim 12, further comprising: a position detector constructed and arranged to detect a first position of said substrate on said intermediate table; a displacement calculator constructed and arranged to calculate a required displacement between said first position and a desired position of the substrate on the intermediate table; and an actuator constructed and arranged to move said substrate from said first position to said desired position.

Claim 23 is dependent from claim 12. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 12, it is respectfully submitted that claim 23 is also patentable for at least the reasons provided above with respect to claim 12. Furthermore, claim 23 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, a position detector constructed and arranged to detect a first position of said substrate on said intermediate table much less a displacement calculator constructed and arranged to calculate a required displacement between said first position and a desired position of the substrate on the intermediate table. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 24 recites: A substrate preparing device according to claim 12, wherein said substrate preparing device is a part of a resist processing apparatus.

Claim 24 is dependent from claim 12. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 12, it is respectfully submitted that claim 24 is also patentable for at least the reasons provided above with respect to claim 12. Furthermore, claim 24 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, the substrate preparing device is part of a resist processing device. Moreover, there is no motivation or suggestion to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 29 recites: A device manufacturing method according to claim 10, further comprising: detecting a first position of said substrate on said intermediate table; calculating a required displacement between said first position and a desired position of the substrate on the intermediate table; and moving said substrate from said first position to said desired position.

Claim 29 is dependent from claim 10. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 10, it is respectfully submitted that claim 29 is also patentable for at least the reasons provided above with respect to claim 10. Furthermore, claim 29 is separately patentable as neither Takizawa nor Ota disclose or suggest, alone or in combination, detecting a first position of the substrate on the intermediate table; calculating a required displacement between the first position and a desired position of the substrate on the intermediate table; and moving the substrate from the first position to the desired position. Moreover, there is no motivation or suggestion to combine to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

> Claim 30 recites: A device manufacturing method according to claim 10, further comprising: generating the gas bearing by delivering gas through said plurality of apertures; and evacuating said gas with a gas pump.

Claim 30 is dependent from claim 10. As neither Takizawa nor Ota, disclose, teach or suggest, alone or in combination, the subject matter recited in claim 10, it is respectfully submitted that claim 30 is also patentable for at least the reasons provided above with respect to claim 10. Furthermore, claim 30 is separately patentable as neither Takizawa nor Ota

disclose or suggest, alone or in combination, generating the gas bearing by delivering gas through the plurality of aperture, and evacuating the gas with a gas pump. Moreover, there is no motivation or suggestion to combine to combine the temperature adjustment plate of Ota with the substrate supporting apparatus of Takizawa.

7. Claims 12 and 13 Are Patentable Over Leoff in view of Doley et al.

The March 21, 2003 Office Action, on pages 5 and 6, paragraph number 3, states "Leoff discloses all the structure set forth in the claims except for the newly added limitation of '...an ionizer constructed and arranged to ionize the gas.' However, the use of an ionizer to ionize the gas in semiconductor wafer handling system is routine in the art as is evident from the teaching of Doley (US 6,161,311) (abstract). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Leoff (US 3,603,646) by including '...an ionizer constructed and arranged to ionize the gas.' The ordinary artisan would have been motivated to modify Leoff (US 3,603,646) in the manner described above for at least the purpose of discharging the static about the intermediate table of the substrate table."

> Claim 12 recites "A substrate preparing device comprising an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus; the intermediate table comprising a major surface provided with a plurality of apertures, and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon; a first temperature controller constructed and arranged to regulate a temperature of the intermediate table; and an ionizer constructed and arranged to ionize the gas."

It is respectfully submitted that Leoff is completely silent about an ionizer constructed and arranged to ionize the gas of a gas bearing and does not disclose, teach or suggest a temperature controller constructed and arranged to regulate a temperature of the intermediate

table. By controlling the temperature of the intermediate table, the temperature of the substrate can be influenced. For example, the temperature of the intermediate table can be maintained at a temperature substantially equal to a temperature of the substrate table. Moreover, Doley is also completely silent about providing a temperature controller constructed and arranged to regulate a temperature of the intermediate table. Doley merely teaches an apparatus for reducing particles in epitaxial reactors used for epitaxial deposition of materials onto a silicon wafer. The apparatus includes lines for delivering a purge gas into a chamber handling the wafer. The purge gas is ionized with ionizers. The conductive ionized gas facilitates the discharge of particles from the wafer or surfaces of the reactor chamber. Doley does not disclose or suggest an ionizer constructed and arranged to ionize the gas of a gas bearing.

Furthermore, it is respectfully submitted that it would not have been obvious to one of ordinary skill in the art to modify Leoff by including an ionizer constructed and arranged to ionize the gas of the gas bearing. Doley is only concerned about producing defect free epitaxial growth silicon layers by reducing or eliminating the undesirable contaminate particles that may enter the semiconductor manufacturing equipment. In contrast, the invention recited in claim 12 is concerned, for example, with eliminating potential sudden discharge of the wafer in a lithographic projection apparatus. Therefore, one of skill in the art would not have been motivated to modify the ionizer of Doley and combine the modified ionizer with the wafer transport system of Leoff. Even if combined, the combination would not result in the invention of claim 12, as the combination would not include, for example, a gas bearing between the major surface of an intermediate table and a substrate located thereon and an ionizer constructed and arranged to ionize the gas. The combination thus fails to present a *prima facie* case of obviousness against claim 12.

Claim 13 recites: A substrate preparing device according to claim 12, wherein said gas bearing generator comprises: a gas source arranged to

deliver gas through the apertures to generate a gas bearing, and an evacuation pump arranged to evacuate the gas from the gas bearing.

Claim 13 is dependent from claim 12. As neither Leoff nor Doley, alone or in combination, disclose, teach or suggest the subject matter recited in claim 12, claim 13 is also not obvious over Leoff in view of Doley. Furthermore, claim 13 is separately patentable as neither Leoff nor Doley disclose or suggest, alone or in combination, the gas bearing generator comprises: a gas source arranged to deliver gas through the apertures to generate a gas bearing, and an evacuation pump arranged to evacuate the gas from the gas bearing.

8. Claims 2, 16 and 25 Are Patentable Over Takizawa in view of Ota and Doley et al.

The March 21, 2003 Office Action, on page 6, paragraph number 4, states "Takizawa and Ota discloses all the structure set forth in the claim except '...wherein said preparatory station comprises a gas ionizer constructed and arranged to ionize said gas.' However, the use of a gas ionizer to ionize gas coming in contact with a photolithographic substrate is routine in the art as is evident from the teaching of Doley et al. (U.S. 6,161,311) (see abstract, lines 19-28, of Doley). Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Takizawa (US 5,471,279) by including '...a gas ionizer constructed and arranged to ionize said gas.' The ordinary artisan would have been motivated to modify Takizawa (US 5,471,279) in the manner described above for at least the purpose of removing any static charge as described by Doley (US 6,161,311) (see abstract, lines 25-28, Doley)."

Claim 2 is dependent from claim 1, claim 16 is dependent from claim 15, and claim 25 is dependent from claim 10. For at least the reasons provided above with respect to claim 1, claim 10 and claim 15, neither Takizawa nor Ota, alone or in combination, disclose, teach

or suggest the subject matter recited in claims 2, 16 and 25. Moreover, Doley fails to overcome the deficiencies noted above with respect to Takizawa and Ota. Furthermore, Doley is only concerned about producing defect free epitaxial growth silicon layers by reducing or eliminating the undesirable contaminate particles that may enter the semiconductor manufacturing equipment. In contrast, the invention recited in claims 2, 16 and 25 is concerned, for example, about eliminating potential sudden discharge of the wafer in a lithographic projection apparatus. Therefore, one of skill in the art would not have been motivated to modify Takizawa to include the ionizer of Doley, which ionizes purge gas, not the gas of a bearing, and even if combined would not result in the subject matter recited in claims 2, 16 and 25.

9. Claims 3, 5, 6, 15, 20-22 and 26-28 Are Patentable Over Takizawa in view of Ota and Tsutsui

The March 21, 2003 Office Action, on page 7, paragraph number 5, states "Regarding claims 3, 20 and 26, Takizawa (US 5,471,279) and Ota (US 6,228,544) discloses all the structure set forth in the claims except '...wherein said intermediate table comprises a first temperature controller constructed and arranged to regulate a temperature of the intermediate table.' However, the use of a temperature controller constructed and arranged to regulate a temperature of a table which hold a substrate is routine in the art as is evident from the teaching of Tsutsui (US 4,720,732) (see abstract, lines 8-13, Tsutsui). Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Takizawa (US 5,471,279) by '...wherein said intermediate table comprises a first temperature controller constructed and arranged to regulate a temperature of the intermediate table.' The ordinary artisan would have been motivated to modify Takizawa (US 5,471,279) in the manner described above so that the reliability of alignment between the pattern of the

mask and the pattern formed on the wafer is improved as described by Tsutsui (see abstract, lines 14-17, Tsutsui)."

"Regarding claims 5, 22 and 27, a further difference between modified Takizawa (US 5,471,279) and the claimed invention is '...wherein said preparatory station comprises a second temperature controller constructed and arranged to regulate the temperature of the gas.' However, Tsutsui (US 4,720,732) discloses a temperature controller (Fig. 1, ref.# 8, Tsutsui) to control the temperature of air flowing into the substrate table. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Takizawa (US 5,471,279) by '...wherein said preparatory station comprises a second temperature controller constructed and arranged to regulate the temperature of said gas.' The ordinary artisan would have been motivated to modify Takizawa (US 5,471,279) in the manner described above to help maintain the same temperature between the substrate and the substrate table so that the reliability of alignment between the pattern of the mask and the pattern formed on the wafer is improved as described in Tsutsui (US 4,720,732) (see abstract, lines 14-17, Tsutsui)."

It is respectfully noted that claim 3 is dependent from claim 1, and claim 26 is dependent from claim 10. Claim 20 has been cancelled without prejudice or disclaimer. For at least the reasons presented above with respect to claims 1 and 10, claims 3 and 26 are not obvious over Takizawa and Ota. Moreover, Tsutsui fails to overcome the deficiencies noted above in Takizawa and Ota as Tsutsui fails to disclose or suggest "the intermediate table comprising a major surface provided with a plurality of apertures; and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon," as recited in claim 1 or "providing the substrate to an intermediate table comprising a major surface provided with a plurality of apertures, and maintaining the

substrate for a given time interval upon a gas bearing generated between the major surface and the substrate," as recited in claim 10. Therefore, claims 3 and 26 are not obvious over Takizawa and Ota in view of Tsutsui.

With regard to claims 5, 22 and 27, it is respectfully noted that claim 5 is dependent from claim 1, claim 22 is dependent from claim 12 and claim 27 is dependent from claim 10. For at least the reasons presented above with respect to claims 1, 10 and 12, it is respectfully submitted that claims 5, 22 and 27 are not obvious over Takizawa and Ota. Moreover, Tsutsui fails to overcome the deficiencies noted above in Takizawa and Ota as Tsutsui fails to disclose or suggest "the intermediate table comprising a major surface provided with a plurality of apertures; and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon," as recited in claim 1 or "providing the substrate to an intermediate table comprising a major surface provided with a plurality of apertures, and maintaining the substrate for a given time interval upon a gas bearing generated between the major surface and the substrate," as recited in claim 10 or "an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus; the intermediate table comprising a major surface provided with a plurality of apertures, and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon," as recited in claim 12. Therefore, Claims 5, 22 and 27 are not obvious over Takizawa and Ota in view of Tsutsui.

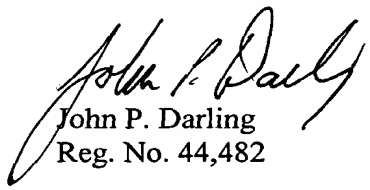
VI. CONCLUSION

For at least the reasons discussed above, it is respectfully submitted that claims 1, 4, 7, 8-15, 17-19, 23, 24, 29 and 30 are patentable over Takizawa in view of Ota, claims 12 and

13 are patentable over Leoff in view of Doley et al., claims 2, 16 and 25 are patentable over Takizawa and Ota as applied to claim 1 and further in view of Doley et al., and claims 3, 5, 6, 15, 20-22 and 26-28 are patentable over Takizawa and Ota as applied to claim 1 and further in view of Tsutsui.

For the above reasons, Appellant respectfully requests this Honorable Board to reverse the rejection of the claims.

Respectfully submitted,
PILLSBURY WINTHROP LLP



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VII. APPENDIX

1. A lithographic projection apparatus, comprising:

a radiation system constructed and arranged to supply a projection beam of radiation;

a mask table provided with a mask holder constructed and arranged to hold a substrate;

a substrate table provided with a substrate holder constructed and arranged to hold a substrate;

a projection system constructed and arranged to image an irradiated portion of the mask onto a target portion of the substrate;

a preparatory station comprising an intermediate table on which a substrate can be positioned before transfer to the substrate table,

the intermediate table comprising a major surface provided with a plurality of apertures; and

a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon.

2. An apparatus according to claim 1, wherein said preparatory station comprises a gas ionizer constructed and arranged to ionize said gas.

3. An apparatus according to claim 1, wherein said intermediate table comprises a first temperature controller constructed and arranged to regulate a temperature of the intermediate table.

4. An apparatus according to claim 1, wherein said gas bearing has a thickness less than 150 μm.

5. An apparatus according to claim 1 wherein said preparatory station comprises a temperature controller constructed and arranged to regulate a temperature of said gas.

6. An apparatus according to claim 3, wherein said first temperature controller maintains the intermediate table and the gas at a temperature substantially equal to a temperature of the substrate table.

7. An apparatus according to claim 1, wherein said apparatus further comprises:

a position detector constructed and arranged to detect a first position of said substrate on said intermediate table;

a displacement calculator for calculating a required displacement between said first position and a desired position of the substrate on the intermediate table; and

an actuator constructed and arranged to move said substrate from said first position to said desired position.

8. An apparatus according to claim 7, wherein said position detector is constructed and arranged to detect an edge of the substrate.

9. An apparatus according to claim 7, wherein said position detector is constructed and arranged to detect a mark on a substrate.

10. A device manufacturing method comprising:

(a) providing a mask table with a mask which contains a pattern,

(b) providing a substrate table with a substrate which is at least partially covered by a layer of radiation-sensitive material,

(c) prior to (b), providing the substrate to an intermediate table comprising a major surface provided with a plurality of apertures, and maintaining the substrate for a given time interval upon a gas bearing generated between the major surface and the substrate; and

(d) using a projection beam of radiation to project an irradiated part of the mask onto a target area of the layer of radiation-sensitive material.

11. A device manufactured in accordance with a method as claimed in claim 10.

12. A substrate preparing device comprising an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus;

the intermediate table comprising a major surface provided with a plurality of apertures, and a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon;

a first temperature controller constructed and arranged to regulate a temperature of the intermediate table; and

an ionizer constructed and arranged to ionize the gas.

13. A substrate preparing device according to claim 12, wherein said gas bearing generator comprises:

a gas source arranged to deliver gas through the apertures to generate a gas bearing, and

an evacuation pump arranged to evacuate the gas from the gas bearing.

14. An apparatus according to claim 7, wherein said gas bearing generator comprises:

a gas source arranged to deliver gas through the apertures to generate the gas bearing, and

an evacuation pump arranged to evacuate the gas from the gas bearing.

15. A substrate preparing device comprising:

an intermediate table on which a substrate can be positioned before transfer to a substrate table in a lithographic projection apparatus, the intermediate table comprising a major surface provided with a plurality of apertures;

a gas bearing generator constructed and arranged to generate a gas bearing between said major surface and a substrate located thereon; and

a temperature controller constructed and arranged to regulate a temperature of at least one of the intermediate table and the temperature of the gas.

16. A substrate preparing device according to claim 15, further comprising:

a gas ionizer constructed and arranged to ionize said gas bearing.

17. A substrate preparing device according to claim 15, further comprising:

a position detector constructed and arranged to detect a first position of said substrate on said intermediate table;

a displacement calculator constructed and arranged to calculate a required displacement between said first position and a desired position of the substrate on the intermediate table; and

an actuator constructed and arranged to move said substrate from said first position to said desired position.

18. A substrate preparing device according to claim 15, wherein said gas bearing generator comprises:

a gas source arranged to deliver gas through said plurality of apertures to generate the gas bearing; and

an evacuation pump arranged to evacuate the gas from the gas bearing.

19. A substrate preparing device according to claim 15, wherein said substrate preparing device is a part of a resist processing apparatus.

21. A substrate preparing device according to claim 12,

wherein said first temperature controller maintains the intermediate table and the gas bearing at a temperature substantially equal to a temperature of the substrate table.

22. A substrate preparing device according to claim 12,

wherein said intermediate table further comprises a second temperature controller constructed and arranged to regulate a temperature of said gas bearing.

23. A substrate preparing device according to claim 12, further comprising:

a position detector constructed and arranged to detect a first position of said substrate on said intermediate table;

a displacement calculator constructed and arranged to calculate a required displacement between said first position and a desired position of the substrate on the intermediate table; and

an actuator constructed and arranged to move said substrate from said first position to said desired position.

24. A substrate preparing device according to claim 12, wherein said substrate preparing device is a part of a resist processing apparatus.

25. A device manufacturing method according to claim 10, further comprising:
ionizing said gas bearing with a gas ionizer.

26. A device manufacturing method according to claim 10, further comprising:
regulating a temperature of said intermediate table with a first temperature controller.

27. A device manufacturing method according to claim 10, further comprising:
regulating a temperature of said gas bearing with a second temperature controller.

28. A device manufacturing method according to claim 10, further comprising:
maintaining said intermediate table and the gas bearing at a temperature substantially equal to a temperature of the substrate table.

29. A device manufacturing method according to claim 10, further comprising:
detecting a first position of said substrate on said intermediate table;
calculating a required displacement between said first position and a desired position of the substrate on the intermediate table; and
moving said substrate from said first position to said desired position.

30. A device manufacturing method according to claim 10, further comprising:
generating the gas bearing by delivering gas through said plurality of apertures; and
evacuating said gas with a gas pump.